What we claim is:

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1. A method for transmitting packet data in the air interface of a digital cellular system based on time division multiple access (TDMA), the system comprising a communications network having at least one base station which serves a cell with wireless bidirectional communications using uplink and downlink time slots a plurality of which comprise an uplink and a downlink TDMA frame, respectively, the system further having at least one mobile station located within the cell, comprising the steps of:

defining downlink logical channels from the base station to the cell, the downlink logical channels being defined to comprise information channels designated for information transmission, the downlink logical channels using the downlink time slots,

defining downlink control channels which include at least one of a paging channel (FP) and an acknowledgement channel (A), of which on the paging channel the base station notifies a mobile station located within the cell of an incoming packet data transmission that is addressed to the mobile station, as well as information channels for transmitting the incoming packet data, the downlink control channels also using the downlink time slots,

defining uplink logical channels from the mobile station to the base station, the uplink logical channels being defined to comprise information channels reserved for information transmission and a reservation request channel (R), the uplink logical channels using the uplink time slots,

making a request to the base station from the mobile station on the reservation request channel to reserve

[a connection for transmitting packet data, and

acknowledging the request by the base station on the acknowledgement channel by identifying those information channels on which the mobile station is to transmit packet data, wherein

in the uplink and the downlink TDMA frames there is assigned at any given time a variable number of time slots designated for packet data transmission, the respective number of assigned uplink time slots and downlink time slots being [a function of one of a symmetricity and an asymmetricity of the packet data transmission, and also on a total demand for packet data transmission in the cell] one of a symmetrical number and an asymmetrical number in dependence upon the demand for packet data transmission in the uplink direction and respectively upon the demand for packet data transmission in the downlink direction, and wherein

any of the downlink time slots in the TDMA frame assigned for packet data transmission can be used for the paging (FP) channel and the acknowledgement (A) channel, and any of the uplink time slots in the TDMA frame that are assigned for packet data transmission can be used for the reservation request (R) channel.

2. A method according to claim 1, wherein on each time slot, transmitted data is subjected to the same interleaving and error correction algorithm, and wherein respective time slots of consecutive TDMA frames constitute independent logical sub-channels which are reserved for a mobile station according to need, and to which the packet data is applied at the beginning of the transmission and wherefrom it is again composed after the transmission.

3. A method according to claim 1, wherein the base station acknowledges the reservation request on a downlink

time slot which corresponds to an uplink time slot wherein the request was transmitted, and in the event that the corresponding downlink time slot is occupied for transmitting information to another mobile station, the corresponding downlink time slot is stolen to be used as an acknowledgment time slot, and the information is transmitted later to the another mobile station.

4. A method according to claim 1, wherein the reservation request is an access burst, and wherein in an information bit part of the access burst there is encoded 12 databits by 1/2 FEC (Forward Error Correction) coding.

5. A method according to claim 1, wherein for a case where the transmission is asymmetric and terminated at the mobile station, the base station indicates to the mobile station on the paging channel on which downlink slots the packet data is transmitted such that a channel is reserved in only one direction at a time for the mobile station, while the time slots of the uplink TDMA frame are available for use by other mobile stations that are located in the cell.

6. A method according to claim 1, wherein for a case where the transmission is asymmetric and originated by the mobile station, the mobile station requests the base station to reserve a connection, which request is acknowledged by the base station on a respective acknowledgement time slot, and at the same time the base station allocates uplink information time slots in which the originating mobile station transmits packet data, wherein information time slots are not reserved in the downlink direction and are available for other use.

7. A method according to claim 6, wherein for each TDMA frame, after the mobile station has transmitted packet data in the allocated time slots, the base station transmits an acknowledgement on a downlink acknowledgement time slot.

8. A method according to claim 1, wherein for the case where the transmission is symmetric and is originated by or terminated by the mobile station, the transmission of packet data alternates on corresponding uplink and downlink time slots.

9. A method according to claim 1, wherein for the case where the transmission is symmetric and is originated by or terminated by the mobile station, only data packets are transmitted in one direction, and only acknowledgements are transmitted in the opposite direction.

10. A method according to claim 9, wherein the transmission of data packets and the corresponding acknowledgements are transmitted so as to alternate on corresponding uplink and downlink time slots.

11. A method according to claim 1, wherein a mobile station that is capable of packet transmission with fewer time slots than are supported by the base station, the mobile station performs a step of determining a number of time slots to use during a TDMA frame.

12. A method according to claim 1, wherein for packet data transmission there are reserved two time slots, one of which is reserved for transmitting control information and the other of which is reserved for transmitting the packet data.

13. A method according to claim 1, wherein for packet data transmission there are reserved two time slots, one of which is reserved solely for transmitting the packet data and the other of which is reserved for transmitting both control information and also the packet data.

14. A method according to claim 13, wherein for the case where the information time slots are reserved for some other use, the information time slots are stolen for transmitting packet data, and wherein if control time slots

are not needed, the unneeded control time slots are used for transmitting packet data.

15. A method for transmitting packet data in the air interface of a digital cellular system based on time division multiple access (TDMA) having uplink and downlink time slots a plurality of which comprise an uplink and a downlink TDMA frame, respectively, comprising the steps of:

defining downlink logical channels from a base station to a cell served by the base station, the downlink logical channels being defined to comprise information channels and control channels, the downlink logical channels using the downlink time slots; and

defining uplink logical channels from a mobile station to a base station, the uplink logical channels being defined to comprise information channels reserved for information transmission and a reservation request channel (R), on which the mobile station requests the reservation of a connection for transmitting packet data, the uplink logical channels using the uplink time slots; wherein

in the uplink and the downlink TDMA frames a variable number of time slots are allocated for packet data transmission, the respective number of assigned uplink time slots and downlink time slots being [a function of one of a symmetricity and an asymmetricity of the packet data transmission, and also on a total demand for packet data transmission in the cell], one of a symmetrical number and an asymmetrical number in dependence upon the demand for packet data transmission in the uplink direction and respectively upon the demand for packet data transmission in the downlink direction.

16. A method according to claim 1, wherein for packet data transmission there are reserved n time slots, one of

which is reserved for transmitting control information and packet data and the other of which is reserved solely for transmitting the packet data.

17. A method for transmitting packet data in the air interface of a digital cellular system based on time division multiple access (TDMA) having uplink and downlink time slots a plurality of which comprise an uplink and a downlink TDMA frame, respectively, comprising the steps of:

defining downlink logical channels from a base station to a cell served by the base station, the downlink logical channels being defined to comprise information channels and control channels, the downlink logical channels using the downlink time slots; and

defining uplink logical channels from a mobile station to a base station, the uplink logical channels being defined to comprise information channels reserved for information transmission and a reservation request channel (R), on which the mobile station requests the reservation of a connection for transmitting packet data, the uplink logical channels using the uplink time slots; wherein

in the uplink and the downlink TDMA frames a variable number of time slots are allocated for packet data transmission, the respective number of assigned uplink time slots and downlink time slots being [a function of one of a symmetricity and an asymmetricity of the packet data transmission, and also on a total demand for packet data transmission in the cell] one of a symmetrical number and an asymmetrical number in dependence upon the demand for packet data transmission in the uplink direction and respectively upon the demand for packet data transmission in the downlink direction, and wherein

for packet data transmission there are reserved n time

slots, one of which is reserved for transmitting control information and packet data and the other of which is reserved solely for transmitting the packet data.

18. A method for transmitting packet data in the air interface of a digital cellular system based on time division multiple access (TDMA) having uplink and downlink time slots a plurality of which comprise an uplink and a downlink TDMA frame, respectively, comprising the steps of:

defining downlink logical channels from a base station to a cell served by the base station, the downlink logical channels being defined to comprise information channels and control channels, the downlink logical channels using the downlink time slots; and

defining uplink logical channels from a mobile station to a base station, the uplink logical channels being defined to comprise information channels reserved for information transmission and a reservation request channel (R), on which the mobile station requests the reservation of a connection for transmitting packet data, the uplink logical channels using the uplink time slots; wherein

in the uplink and the downlink TDMA frames a variable number of time slots are allocated for packet data transmission, the respective number of assigned uplink time slots and downlink time slots being [a function of one of a symmetricity and an asymmetricity of the packet data transmission, and also on a total demand for packet data transmission in the cell] one of a symmetrical number and an asymmetrical number in dependence upon the demand for packet data transmission in the uplink direction and respectively upon the demand for packet data transmission in the downlink direction, and wherein

the base station acknowledges the mobile station's reservation request on a downlink time slot which corresponds to an uplink time slot wherein the reservation request was transmitted, and in the event that the corresponding downlink time slot is assigned for transmitting information to another mobile station, the corresponding downlink time slot is stolen by the base station for use in transmitting the acknowledgment time slot, and the information is transmitted later to the other mobile station.

19. A method for transmitting packet data in the air interface of a digital cellular system based on time division multiple access (TDMA) having uplink and downlink time slots a plurality of which comprise an uplink and a downlink TDMA frame, respectively, comprising the steps of:

defining downlink logical channels from a base station to a cell served by the base station, the downlink logical channels being defined to comprise information channels and control channels, the downlink logical channels using the downlink time slots; and

defining uplink logical channels from a mobile station to a base station, the uplink logical channels being defined to comprise information channels reserved for information transmission and a reservation request channel (R), on which the mobile station requests the reservation of a connection for transmitting packet data, the uplink logical channels using the uplink time slots; wherein

in the uplink and the downlink TDMA frames a variable number of time slots are allocated for packet data transmission, the respective number of assigned uplink time slots and downlink time slots being [a function of one of a symmetricity and an asymmetricity of the packet data transmission, and also on a total demand for packet data transmission in the cell] one of a

symmetrical number and an asymmetrical number in dependence upon the demand for packet data transmission in the uplink direction and respectively upon the demand for packet data transmission in the downlink direction, and wherein

for the case where the transmission is symmetric and is originated by or terminated by the mobile station, only data packets are transmitted in one direction, and only acknowledgements are transmitted in the ~~opposite direction~~.

20. A method according to claim 1, wherein the respective number of assigned uplink time slots and downlink time slots further being dependent upon a total demand for packet data transmission in the cell.

21. A method according to claim 15, wherein the respective number of assigned uplink time slots and downlink time slots further being dependent upon a total demand for packet data transmission in the cell.

22. A method according to claim 17, wherein the respective number of assigned uplink time slots and downlink time slots further being dependent upon a total demand for packet data transmission in the cell.

23. A method according to claim 18, wherein the respective number of assigned uplink time slots and downlink time slots further being dependent upon a total demand for packet data transmission in the cell.

24. A method according to claim 19, wherein the respective number of assigned uplink time slots and downlink time slots further being dependent upon a total demand for packet data transmission in the cell.